

Work Order ID 130086

Monday, February 23, 2015 10:50:49 AM

130086**U/R** *OK*

Page 1

Item ID: D412-664-443TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 2/23/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 2/23/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: *MCS*Date: *1502-23* Tooling:

Date:

Run Start ***NR1***

QC:

Date: SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

D412-664-443

REV A *U/R* *OK* *CP* *15/2/23*

0.00

100

MORI SEIKI CNC LATHE LARGE

0.00

Mori Seiki

Memo

Mori Seiki CNC Lathe Large

1-Cut tube on chop saw, leave extra mat'l for facing.
2-Face tube to length.

110

QC1- Inspect dimensions to dimension sheet

0.00

110

QC

Memo

0.00

Quality Control

1 *φ**mmL*
*15/03/03**1* *φ**mmL*
15/03/05

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube ☐</td> <td>Crosstube ☐</td> <td>Water Jet ☐</td> <td>Engineering ☐</td> </tr> <tr> <td>Machining ☐</td> <td>Small Fab ☐</td> <td>Prod. Eng. Coord. ☐</td> <td>Quality ☐</td> </tr> <tr> <td>Thermoforming ☐</td> <td>Finishing ☐</td> <td>Rec/Store/Packaging ☐</td> <td>Other ☐</td> </tr> <tr> <td>Large Fab ☐</td> <td>Composite ☐</td> <td>Supplier ☐</td> <td></td> </tr> </table>	Skid-tube ☐	Crosstube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐	
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Large Fab ☐	Composite ☐	Supplier ☐																

Root Cause	Date	Step	Qty	Description of work order update or non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Design									
Doc/Data									
Equip/Tooling									
Handling/Pre									
Material									
Operator									
Offset/Setup									
Process									
Supplier									
Training									
Transport									
Unapproved									

FAULT CATEGORY

Landing Gear	General	Other
☐ Bending	☐ Bend	☐ Folio/Program
☐ Centre Not Concentric	☐ BOM/Route	☐ Grain
☐ Cracks	☐ Broken/Damage/Defect	☐ Hardware
☐ Crimp/Kink/Ripple/Wave	☐ Burrs	☐ Inspection Incomplete/Unqualified
☐ Cuffs	☐ Contamination	☐ Instructions Incomplete/Unclear
☐ Crushing	☐ Countersink	☐ Misaligned/off center
☐ Heat Treat	☐ Cut Too Short	☐ Mislabeled
☐ Inspection Strip in Tube	☐ Drawing	☐ Misread
☐ Marks/Chatter	☐ Drill Holes	☐ Off-set
☐ Turning Sequence	☐ Finish	☐ Out of Calibration
☐ Wave/Twist in Tube	☐ Fit/Function	☐ Out of Sequence
		☐ Outside Dimensions
		☐ Over/Under tolerance
		☐ Part Incorrect
		☐ Part Lost/Missing
		☐ Part Moved
		☐ Positioned Wrong
		☐ Power Loss/Surge
		☐ Pressure/Forced
		☐ Set-up
		☐ Temperature/Cure
		☐ Weld
		☐ Wrong Stock Pulled
		☐ Other

Work Order ID 130086

130086

Page 2

Monday, February 23, 2015 10:50:49 AM

Item ID: D412-664-443TRN

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N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 2/23/2015 Start Qty: 1.00

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Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120	MORI SEIKI CNC LATHE LARGE	0.00							
120									
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Fill tube with sand & install plugs on both ends 2-Turn as per Folio FB216 3- File transition lines smooth. 4-Scribe part # as per Dwg D412-664-443 FOLIO REV: _____ DWG REV: <u> A </u>								mm 15/03/10
130	QC1- Inspect dimensions to dimension sheet	0.00							
130									
QC	Memo	0.00							
Quality Control									mm 15/03/10
140	QC8- Inspect parts - second check	0.00							
140									
QC	Memo	0.00							
Quality Control									DAS 47 9-89 15-04-06

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube ☐</td> <td>Crosstube ☐</td> <td>Water Jet ☐</td> <td>Engineering ☐</td> </tr> <tr> <td>Machining ☐</td> <td>Small Fab ☐</td> <td>Prod. Eng. Coord. ☐</td> <td>Quality ☐</td> </tr> <tr> <td>Thermoforming ☐</td> <td>Finishing ☐</td> <td>Rec/Store/Packaging ☐</td> <td>Other ☐</td> </tr> <tr> <td>Large Fab ☐</td> <td>Composite ☐</td> <td>Supplier ☐</td> <td></td> </tr> </table>	Skid-tube ☐	Crosstube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐	
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Root Cause	Date	Step	Qty	Description of work order update or non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Design									
Doc/Data									
Equip/Tooling									
Handling/Pre									
Material									
Operator									
Offset/Setup									
Process									
Supplier									
Training									
Transport									
Unapproved									

FAULT CATEGORY

Landing Gear ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Inspection Strip in Tube ☐ Marks/Chatter ☐ Turning Sequence ☐ Wave/Twist in Tube	General ☐ Bend ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Burrs ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Drawing ☐ Drill Holes ☐ Finish ☐ Fit/Function	☐ Folio/Program ☐ Grain ☐ Hardware ☐ Inspection Incomplete/Unqualified ☐ Instructions Incomplete/Unclear ☐ Misaligned/off center ☐ Mislabeled ☐ Misread ☐ Off-set ☐ Out of Calibration ☐ Out of Sequence	☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Positioned Wrong ☐ Power Loss/Surge ☐ Pressure/Forced ☐ Set-up ☐ Temperature/Cure ☐ Weld ☐ Wrong Stock Pulled ☐ Other
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Work Order ID 130086

Monday, February 23, 2015 10:50:49 AM

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Page 3

Item ID: D412-664-443TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 2/23/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 2/23/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

150

0.00

150

Large Fab

Crosstubes

Memo

0.00

Crosstubes

Grind machining marks smooth longitude way.

TW 15-04-06

180

QC15- Crosstube Dimensional Check

0.00

180

QC

Memo

0.00

Quality Control

N/A 15-04-06

190

Identify as per dwg & Stock Location: LG

0.00

190

Packaging

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: _____

BC 15/04/06

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



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Root Cause	Date	Step	Qty	Description of work order update or non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Design				Step not applicable					
Doc/Data		120							
Equip/Tooling									
Handling/Pre									
Material									
Operator									
Offset/Setup									
Process									
Supplier									
Training									
Transport									
Unapproved									

FAULT CATEGORY

Landing Gear ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Inspection Strip in Tube ☐ Marks/Chatter ☐ Turning Sequence ☐ Wave/Twist in Tube	General ☐ Bend ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Burrs ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Drawing ☐ Drill Holes ☐ Finish ☐ Fit/Function	☐ Folio/Program ☐ Grain ☐ Hardware ☐ Inspection Incomplete/Unqualified ☐ Instructions Incomplete/Unclear ☐ Misaligned/off center ☐ Mislabeled ☐ Misread ☐ Off-set ☐ Out of Calibration ☐ Out of Sequence
		☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Positioned Wrong ☐ Power Loss/Surge
		☐ Pressure/Forced ☐ Set-up ☐ Temperature/Cure ☐ Weld ☐ Wrong Stock Pulled ☐ Other

Work Order ID 130086***130086***

Page 4

Item ID: D412-664-443TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 2/23/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 2/23/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

200

QC21- Final Inspection - Work Order Release

0.00

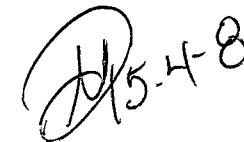
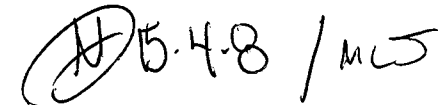
200

QC

Memo

0.00

Quality Control



DQA: _____ Date: _____



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Training									
Transport									
Unapproved									

FAULT CATEGORY

Landing Gear ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Inspection Strip in Tube ☐ Marks/Chatter ☐ Turning Sequence ☐ Wave/Twist in Tube	General ☐ Bend ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Burrs ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Drawing ☐ Drill Holes ☐ Finish ☐ Fit/Function	☐ Folio/Program ☐ Grain ☐ Hardware ☐ Inspection Incomplete/Unqualified ☐ Instructions Incomplete/Unclear ☐ Misaligned/off center ☐ Mislabeled ☐ Misread ☐ Off-set ☐ Out of Calibration ☐ Out of Sequence	☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Positioned Wrong ☐ Power Loss/Surge ☐ Pressure/Forced ☐ Set-up ☐ Temperature/Cure ☐ Weld ☐ Wrong Stock Pulled ☐ Other
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Picklist Print

Monday, February 23, 2015 10:50:54 AM

Page 1

Work Order ID: 130086

130086

Parent Item: D412-664-443TRN

D412-664-443TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 2/23/2015

Required Date: 2/23/2015

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP REV:A NEW ISSUE 13-09-26 JLM VERIFIED BY:DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6020-160		Manufactured	No				Each	29.0000		1			

D6020-160

**

Crosstube Material

Location	Loc Qty	Loc Code
HALL	28	
	28	
LG003	1	
126259	1	

126259

1 amm L 15/02/27

DQA: _____ Date: _____



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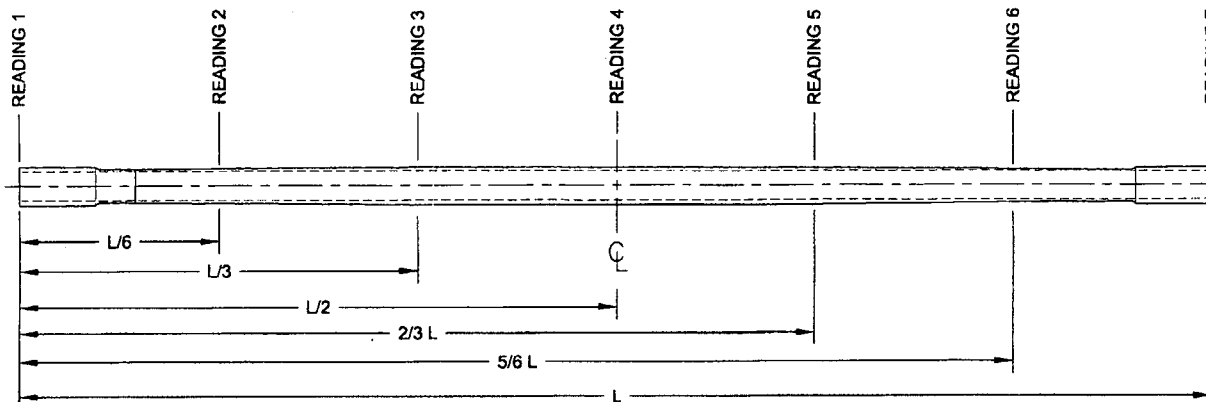
DART AEROSPACE LTD	Work Order: 130086
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments	
SIDE A	2.776	+0.005/-0.000	2.779	/		vern	CNC-08
	2.776	+0.005/-0.000	2.780	/			
	2.880	+0.005/-0.000	2.884	/			
	2.990	+0.005/-0.000	2.993	/			
	3.100	+0.005/-0.000	3.104	/			
	3.250	+0.005/-0.000	3.254	/			
						VL	
	7.980	+/-0.060	7.980	/		vern	CNC-08
	0.063	+/-0.010	.063	✓		RG	
	0.500	+/-0.010	.500	/		"	
	2.990	+0.005/-0.000	2.992	/		vern	CNC-08
SIDE B	2.776	+0.005/-0.000	2.778	/		vern	CNC-08
	2.776	+0.005/-0.000	2.780	/			
	2.880	+0.005/-0.000	2.884	/			
	2.990	+0.005/-0.000	2.994	/			
	3.100	+0.005/-0.000	3.104	/			
	3.250	+0.005/-0.000	3.254	/			
	7.98	+/-0.060	7.98	/		vern	CNC-08
	R0.06	+/-0.010	.063	✓		RG	
	R0.50	+/-0.010	.0500	/		"	
	Ø2.990	+0.005/-0.000	2.990	/		vern	CNC-08
130.10	+/-0.060	130.100	✓		tape	LG-11	

DART AEROSPACE LTD	Work Order: 130086
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.312	.314	.299	.297	.017	0.073"
READING 2 L= 21	.211	.220	.196	.182	.038	
READING 3 L= 44	.318	.329	.319	.309	.020	
READING 4 L= 65	.434	.434	.433	.433	.001	
READING 5 L= 86	.324	.314	.316	.326	.012	
READING 6 L= 109	.209	.203	.197	.203	.012	
READING 7 L= 130	.307	.309	.305	.305	.004	

Calibration Result

Actual Block Thickness: .100 - .500

Sitiescan 250 Measured Thickness: .100 - .500

DAS
47

Measured by: gmm
Date: 15/03/10

Audited by: 9-89
Date: 15-04-06

Preliminary Approval:
Date:

Rev	Date	Change	Revised by	Approved
A	14.06.24	New Issue (P/O D412-664-403)	KJ	

Item	Qty -443	Part Number	Description
1	X	D412-664-443	CROSSTUBE ASSEMBLY (412 HI AFT)
2	1	D6020-132	CROSSTUBE MATERIAL (132" MIN. LENGTH)
3	2	D3595-063-530	RUBBER CUSHION
4	1	D4909-1	SUPPORT
5	2	D4910-1	CHAFING SHIELD
7	4	MS21920-26	CLAMP
8	2	MS21920-28	CLAMP
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890	SEALANT

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6020-132
FINISHED LENGTH = 130.10±0.060 (BEFORE BENDING/TRIMMING)
- FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART P/N "D412-664-443" AND B/N ON INSIDE OF CUFF PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 90.2 lb AFTER MACHINING
86.7 lb FINISHED WEIGHT
- PART IS SYMMETRIC ABOUT CENTERLINE.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.

BENDING

- BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R35 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

ASSEMBLY

- INSTALL D4909-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- INSTALL MS21920-28 CLAMPS WITH D3595-063-530 RUBBER CUSHIONS TO SECURE THE D4909-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP OF CROSSTUBE SUPPORT.
- IF NOT ALREADY PRESENT ON CHAFING SHIELD, APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D4910-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D4910-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- TORQUE CLAMPS ON D4909-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D4910-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

130086.MLS
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UNDER REVIEW

11/7/20

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2014-05-26

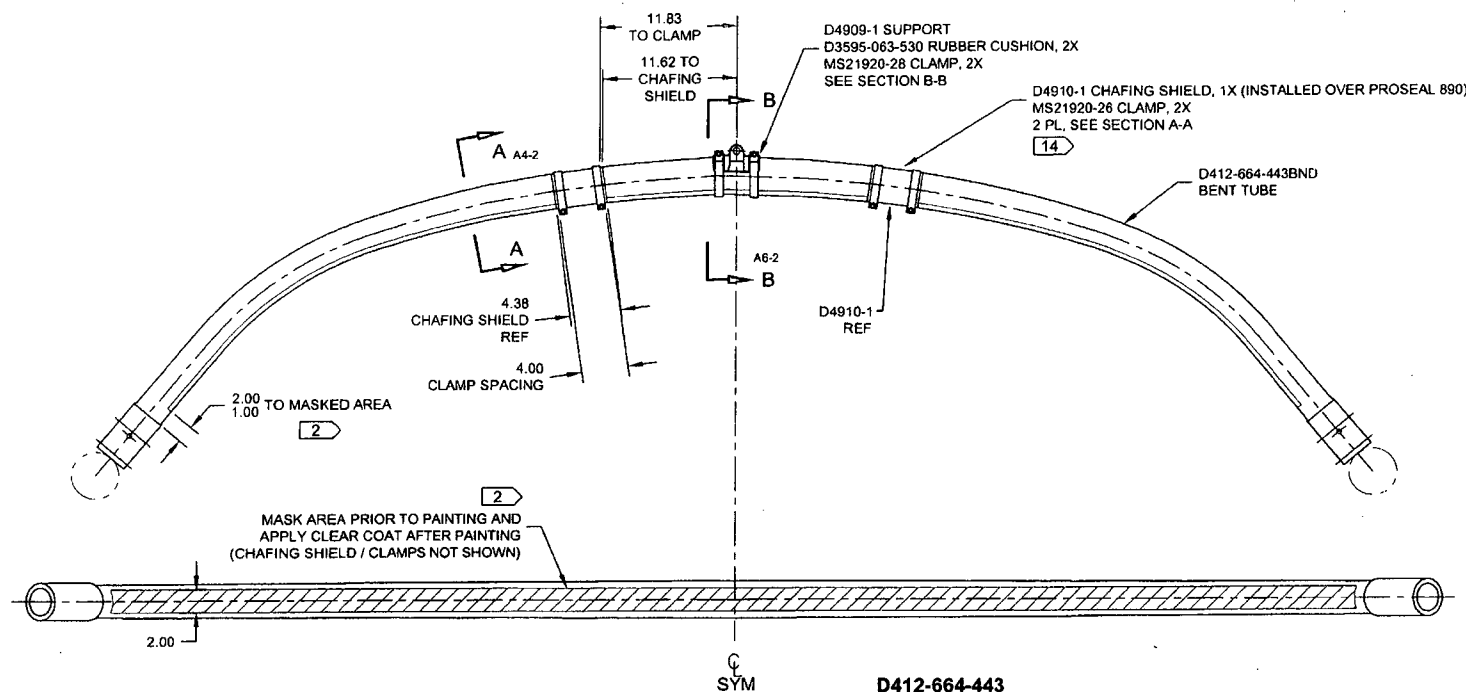
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DESIGN	DP		
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DART AEROSPACE LTD
HAWKESBURY, ONTARIO, CANADA

DRAWING NO. REV. A
D412-664-443 SHEET 1 OF 4

TITLE SCALE
CROSSTUBE ASSY (412 HI AFT) NTS

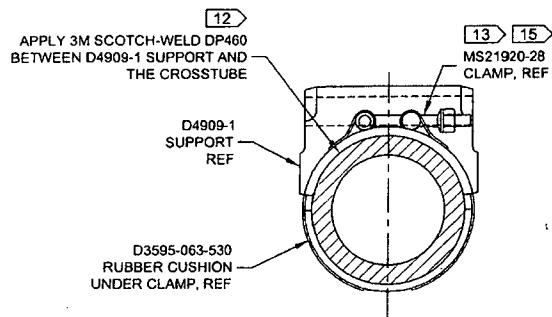
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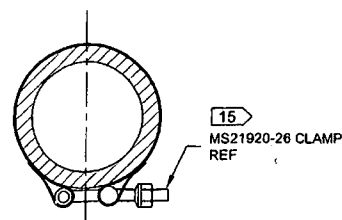
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ASSEMBLY DETAIL

UNDER REVIEW
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2014-05-26
WMD

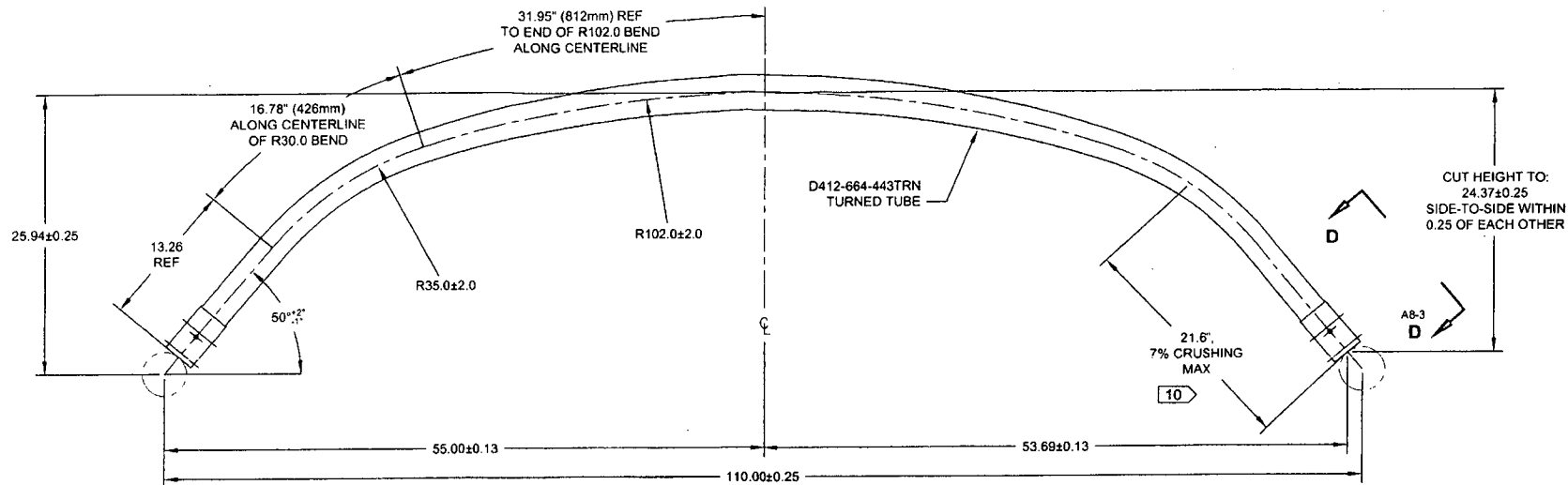


SECTION B-B D4-2
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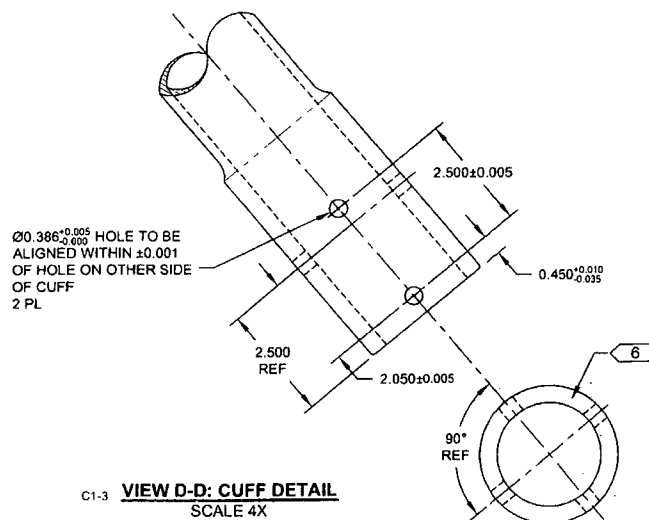


SECTION A-A C6-2
SCALE 4X

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MFG. APPR.		D412-664-443	SHEET 2 OF 4
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D412-664-443BND
BENDING DETAIL

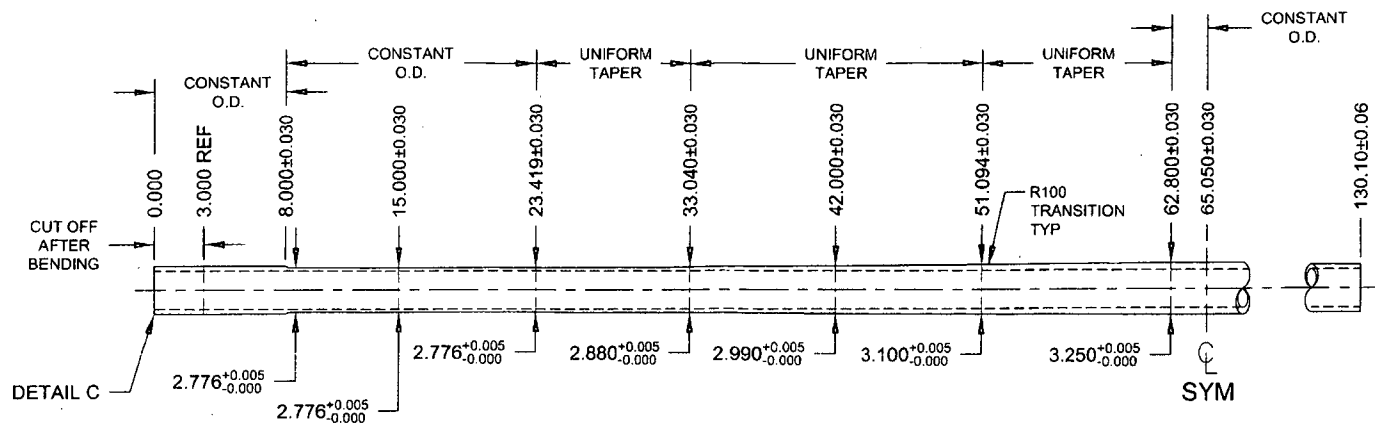


VIEW D-D: CUFF DETAIL
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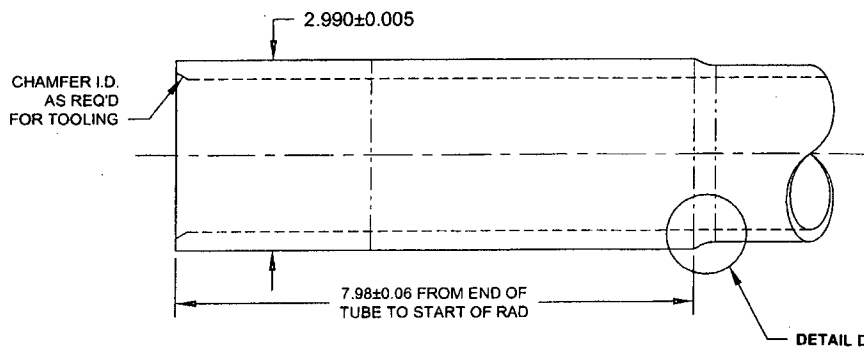
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2014-05-26

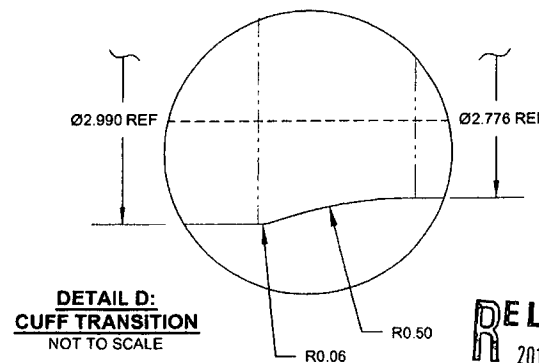
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D412-664-443TRN
TURNING DETAIL



DETAIL C:
CUFF TRANSITION
SCALE 4X



DETAIL D:
CUFF TRANSITION
NOT TO SCALE

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UNDER REVIEW

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2014-05-26

DESIGN	<i>Q</i>	DART AEROSPACE LTD	
DRAWN	<i>Q</i>	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>Q</i>	DRAWING NO.	REV. A
MFG. APPR.	<i>Q</i>	D412-664-443	SHEET 4 OF 4
APPROVED	<i>Q</i>	TITLE	SCALE
DE APPR.	<i>Q</i>	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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